



UAH ChargerSat-2 Parabolic Flight Testing

Problem Statement

Micro-G Boiling Instrument

- This experiment will investigate the relationship between surface roughness and nucleate boiling in microgravity.
- This investigation will allow future spacecraft thermal management system to take advantage of the nucleate boiling regime

Drag Device/Reentry Accelerator

- This technology will allow nanosatellites to deorbit quicker after EOM in a controlled manner
- The technology proven on orbit will allow future CubeSat missions to go higher than currently possible and deorbit quicker in a predictable manner.

Parabolic flights will allow these technologies to achieve TRL6 before orbital flight on the ChargerSat-2 mission.

Technology Development Team

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Proposed Flight Experiment

Experiment Readiness:

- Mid-January 2013

Test Vehicles:

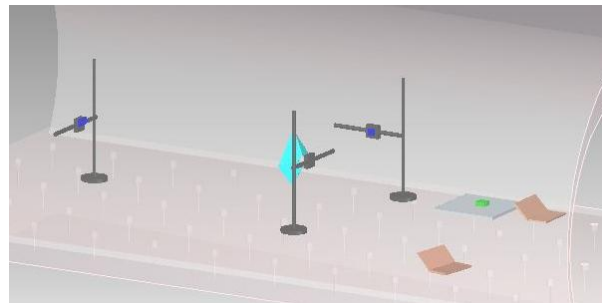
- Parabolic aircraft

Test Environment:

- Both the Boiling Instrument and the Drag Device have been lab tested in 1G.
- To move past TRL4 we need to test both of these technologies in microgravity.

Test Apparatus Description:

- The Drag Device is cyan in the center, Cameras and 3D Scanner are blue, Camera Stands are black, the Laptops are copper, the boiling instrument is green, it is mounted to a metal plate which is mounted to the floor



Rough Representation of the Test Setup

Technology Maturation

Micro-G Boiling Instrument (TRL4)

- Parabolic Flight: **Target TRL: 6**
- Expected Completion: April 2013
- Successful acquisition of multiple data sets of boiling properties
- Orbital Launch: **Target TRL: 9**
- December 2013 – Q4 2016

Drag Device (TRL4)

- Parabolic Flight: **Target TRL: 6**
- Expected Completion: April 2013
- Successful actuation and mapping of the sail
- Orbital Launch: **Target TRL: 9**
- December 2013 – Q4 2016

Objective of Proposed Experiment

1. Verify the functionality of the deployable drag device
 2. Capture 3D surface maps of the drag device
 3. Validate the performance of the boiling instrument in a microgravity environment
- 3D surface scans will be used to generate inputs to stability models
 - Videos of the drag device deployment will be used to validate successful actuation
 - Heat Transfer will be collected to validate the boiling instrument's performance

Applicable Technology Areas: TA09, TA10, TA11, TA12, and TA14